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Apparatus for replenishing the supplies of filter rod sections in the magazines of filter tipping machines

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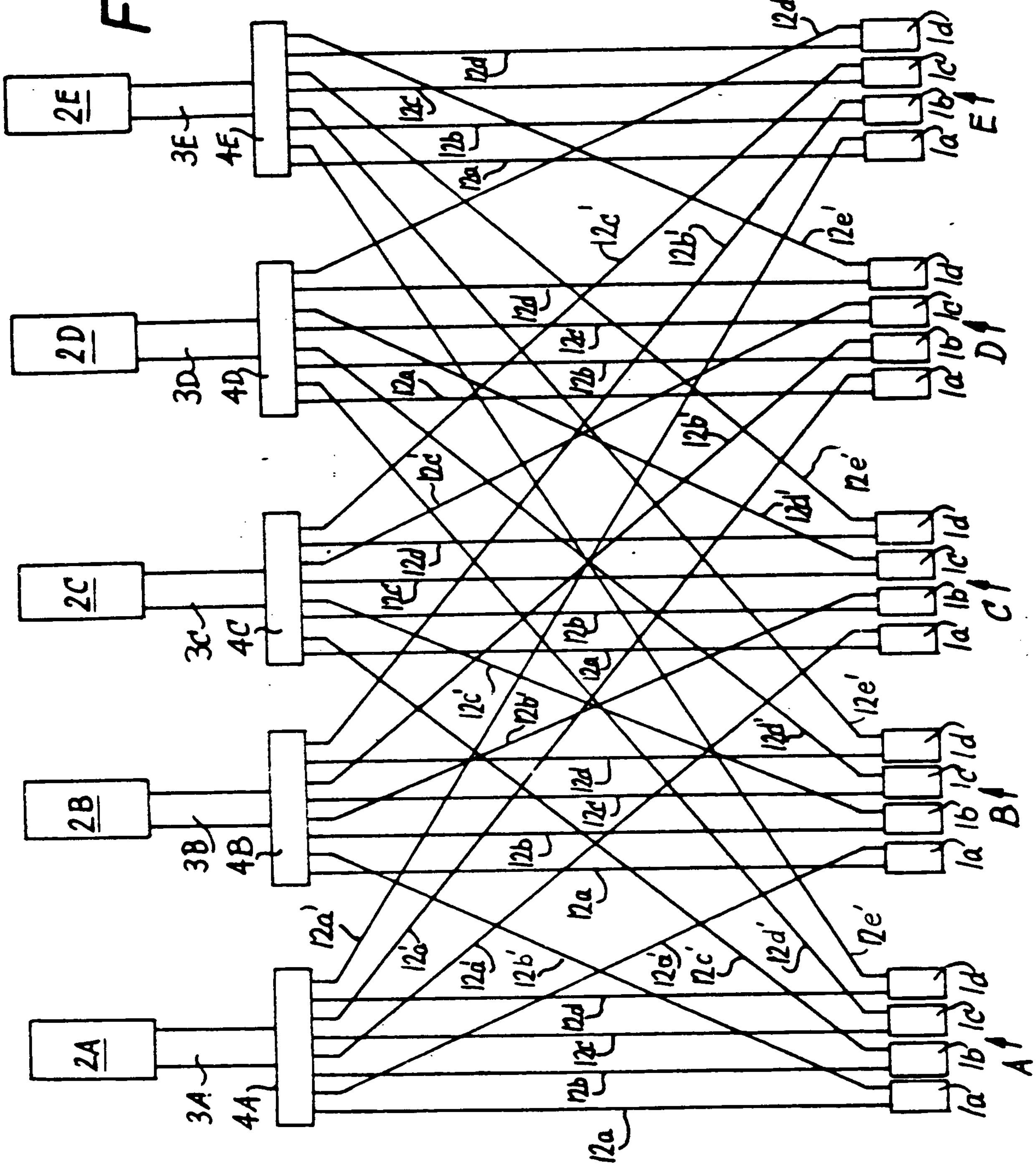
Fig.1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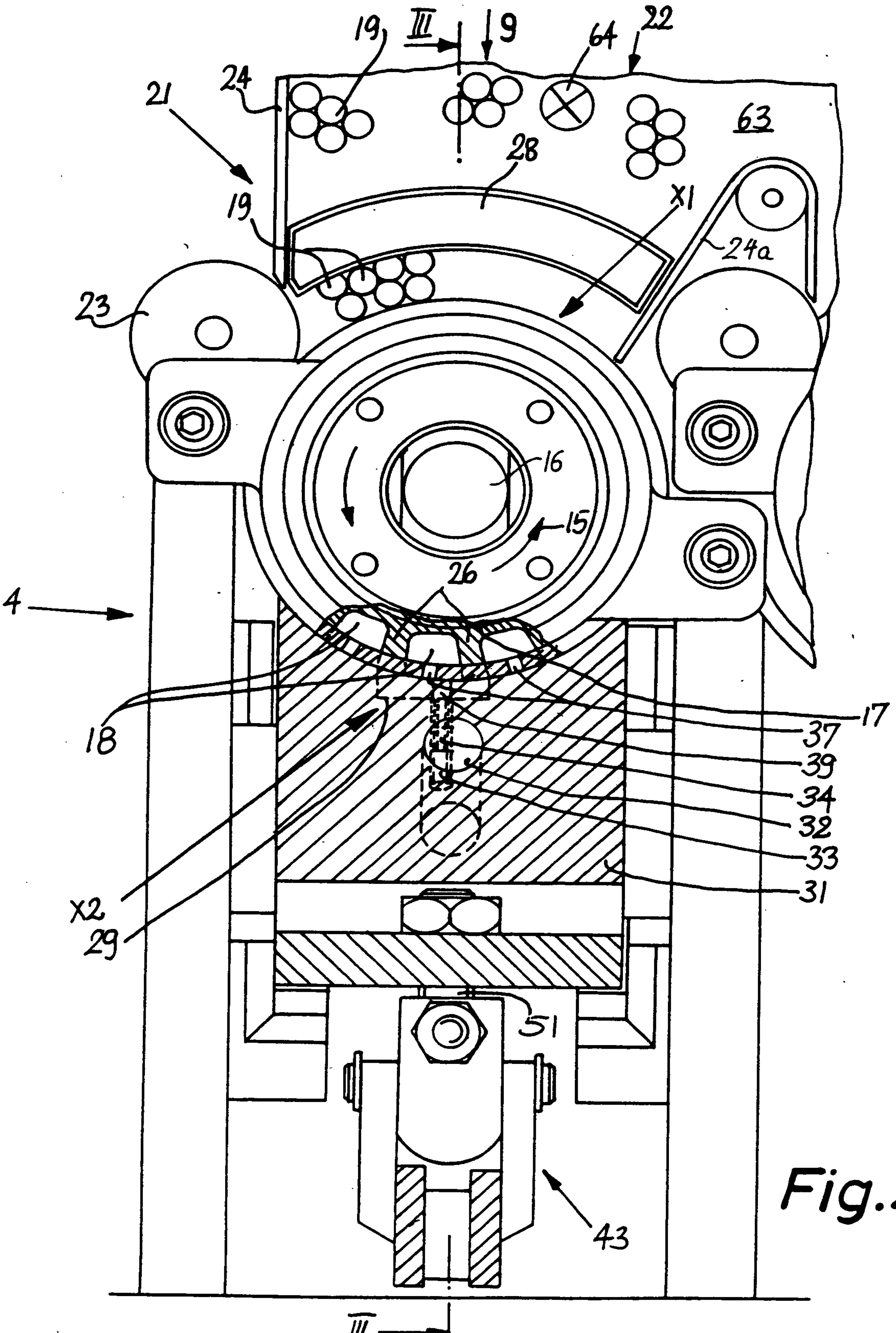
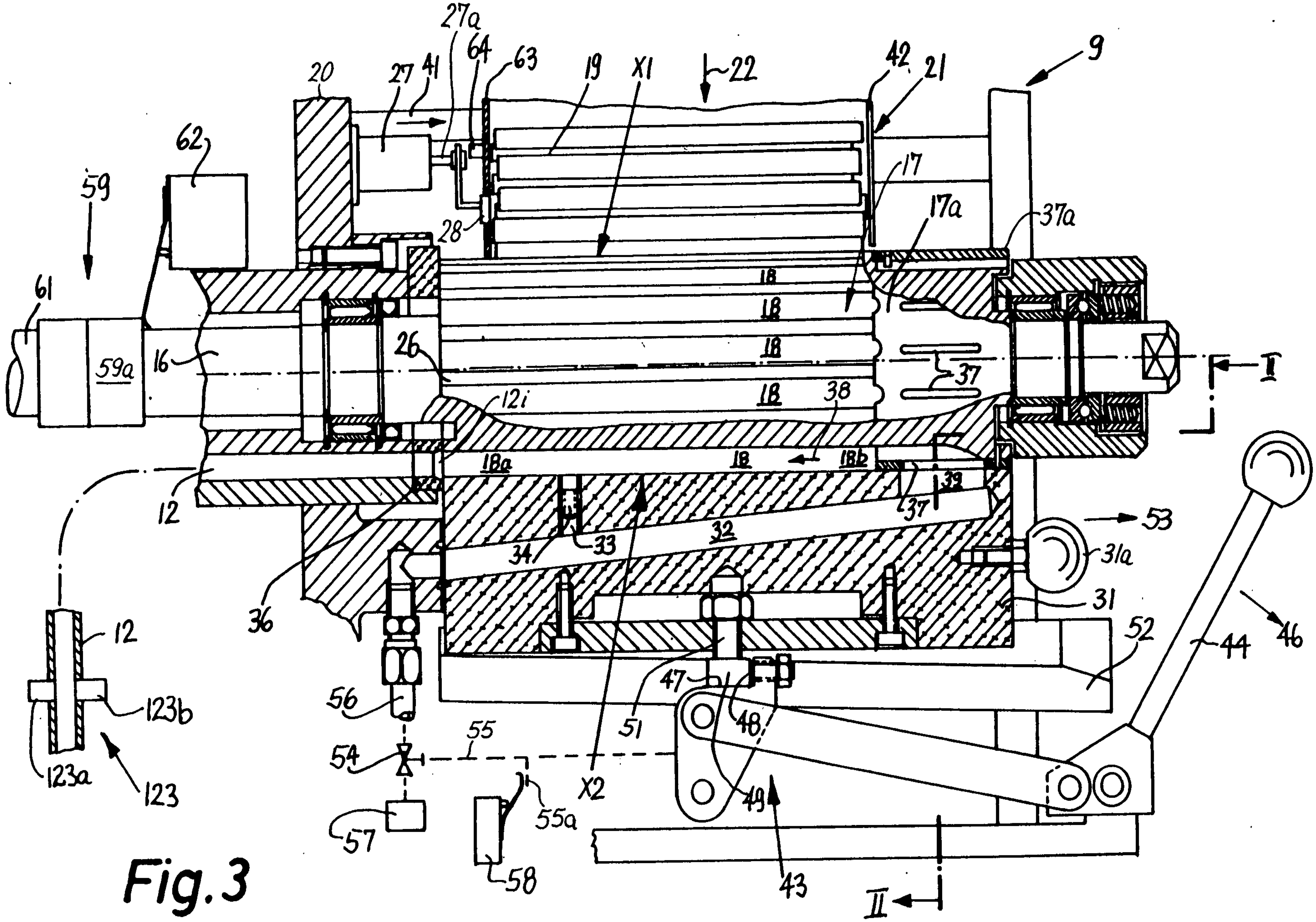


Fig.2



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12i
18
18a
18b
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34
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32
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31a
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52
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I
II

Fig.3

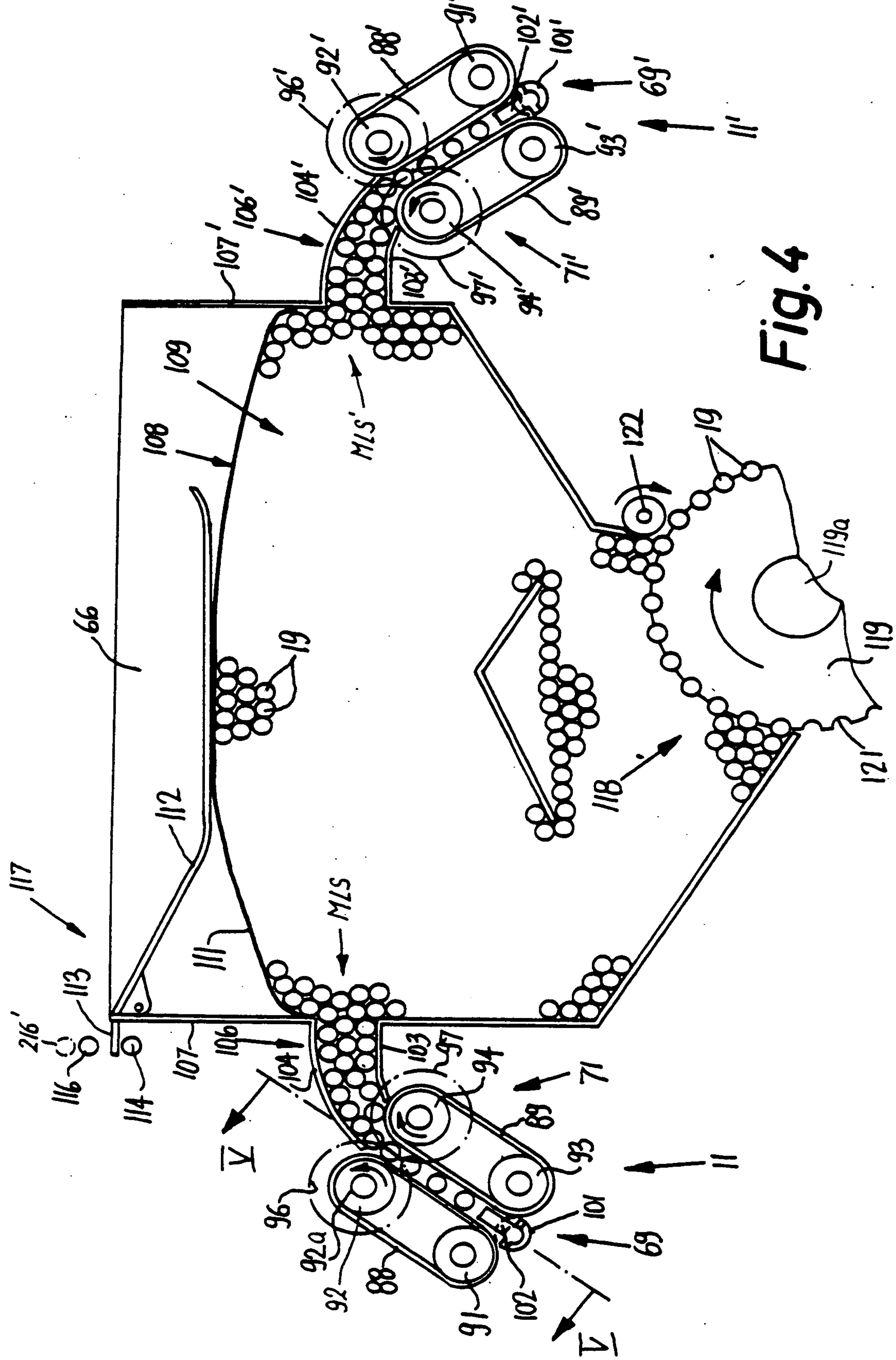
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Fig. 4

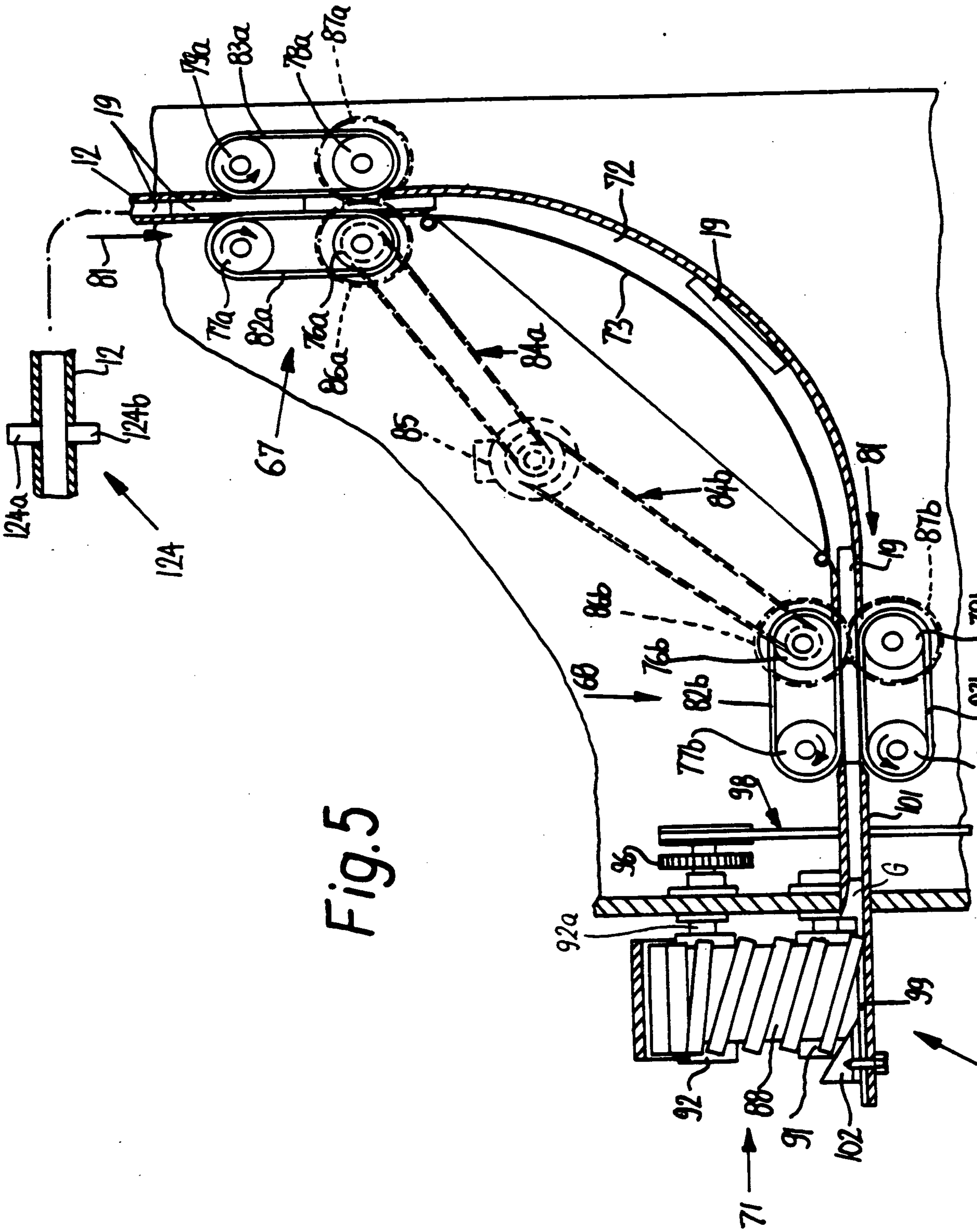
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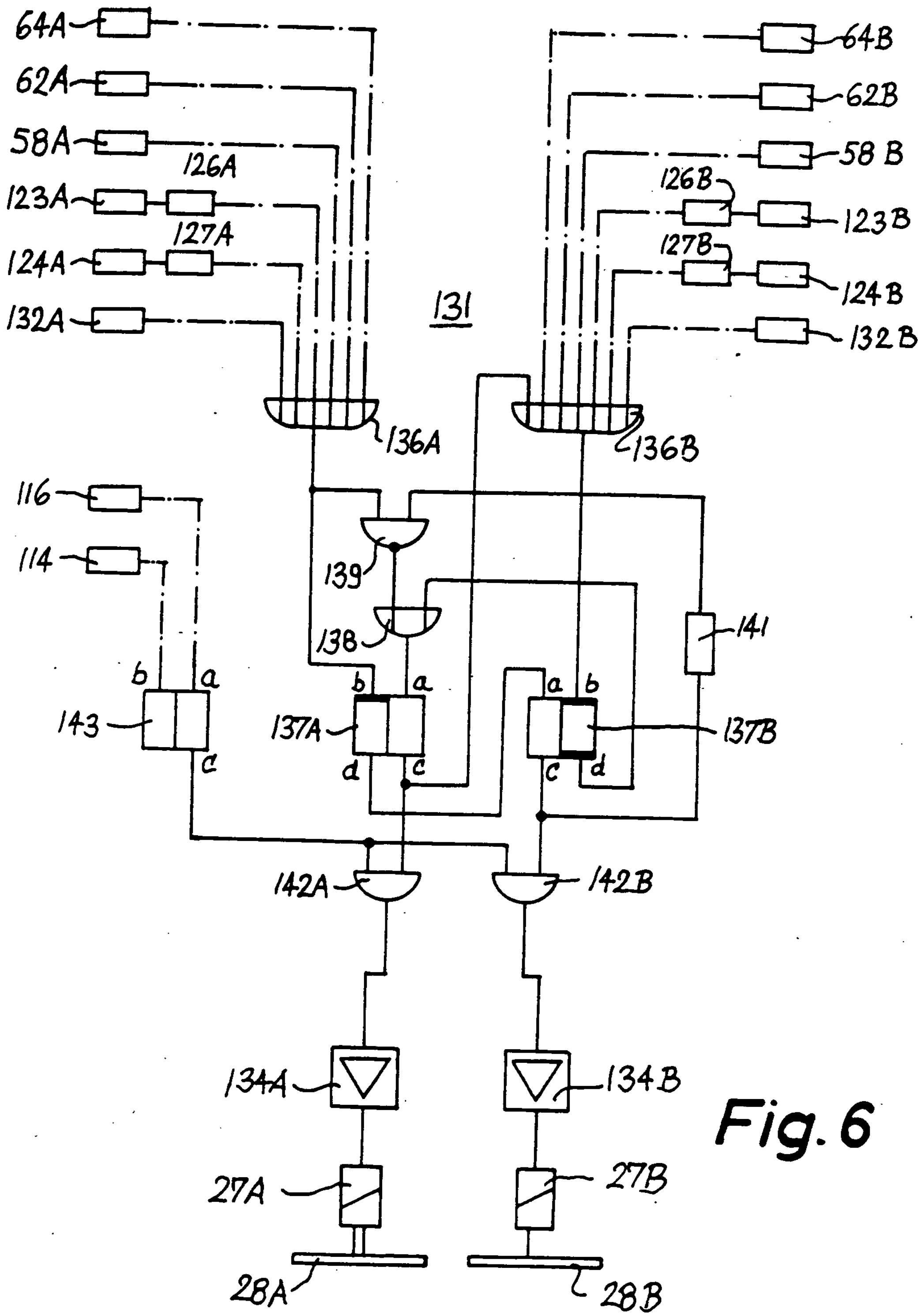
Fig.5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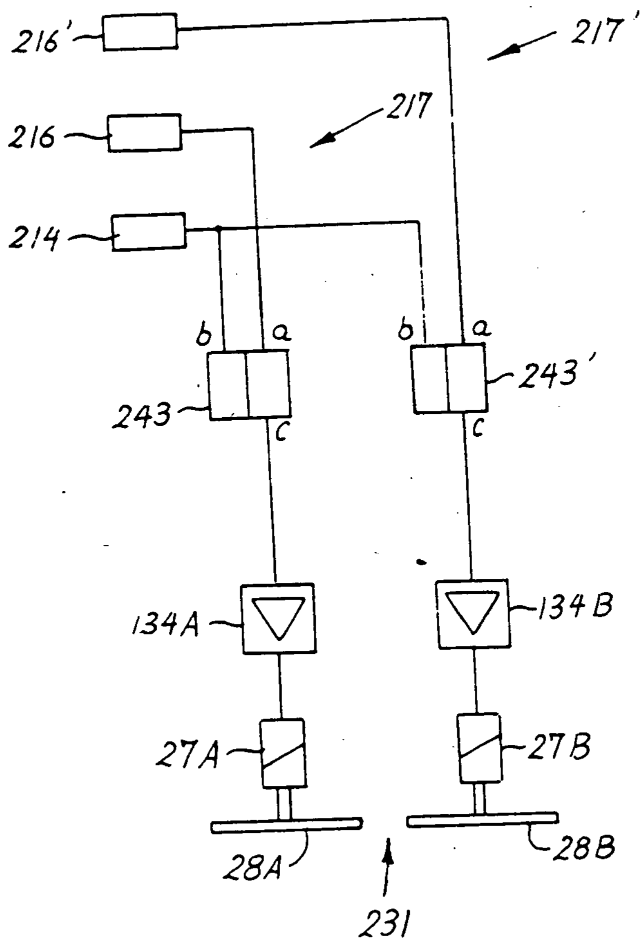
27B
28A
28B

Fig. 6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28A
28B
231

Fig. 7

APPARATUS FOR REPLENISHING THE SUPPLIES OF FILTER ROD SECTIONS IN THE MAGAZINES OF FILTER TIPPING MACHINES.

The present invention relates to apparatus for replenishing the supplies of filter rod sections in the magazines of filter processing machines, especially in the magazines of filter tipping machines. More particularly, the invention relates to improvements in apparatus for manipulating filter rod sections wherein machines which process filter rod sections receive such sections by way of pneumatic senders serving to admit rod-shaped articles into pneumatic conveyors which, in turn, deliver the articles to the magazines of the processing machines.

It is already known to transport filter rod sections from a maker to a processing machine by resorting to a pneumatic sender which cooperates with a pneumatic conveyor, and to a receiver at the discharge end of the pneumatic conveyor. The sender has a propelling unit which delivers filter rod sections into the inlet of the pneumatic conveyor wherein the sections move axially, and the receiving unit is provided with means for changing the direct of movement of successively delivered filter rod sections from axial movement to sidewise movement preparatory to and during introduction into the magazine of the processing machine. The ju discussed systems for delivery of filter rod sections from a maker to a processing machine are used in preference to older systems which employ so-called chargers or trays. The systems which employ chargers exhibit a number of drawbacks, especially a regards their bulk, the cost of the chargers and other equipment,

as well as the number of chargers which are needed to accumulate and maintain a requisite supply of articles between the maker and the processing machine. Moreover, the trend is toward the establishment of complete production lines, i.e., a manufacturer of filter cigarettes prefers to set up several lines wherein one or more machines produce filter rod sections, wherein one or more machines produce plain cigarettes, and wherein one or more machines combine plain cigarettes with filter rod sections to form filter cigarettes of desired length. The use of chargers in such production lines is cumbersome; therefore, the chargers are on the way out, at least in the majority of tobacco processing plants.

It is often desirable to install a reservoir system between one or more makers of filter rod sections and the pneumatic sender to thus ensure that the sender can receive filter rod sections for a reasonably long interval of time if and when the maker breaks down or is intentionally arrested by the attendants. The reservoir system (e.g., a system known as RESY and manufactured by the assignee of the present application) can compensate for differences between the output of a maker of filter rod sections and the requirements of one or more processing machines, especially filter tipping machines. Moreover, the reservoir system can serve as a depository for filter rod sections during the interval of curing which follows the making of filter rod sections and must precede the conversion of such sections into filter plugs of cigarettes or analogous rod-shaped smokers' products. The provision of

reservoir systems is desirable on the additional ground that the output of a modern filter tipping machine is very high (normally . the range of one hundred cigarettes per second) so that the utilization of a reservoir system ensures that the filter tipping machine can operate for a reasonable period of time subsequent to deactivation or a slowdown of the producing machine or machines. The magazine of a filter tipping machine is much too small to sto: a reasonable supply of filter rod sections so that, in the absenc of a reservoir system or another relatively large source of suppl of filter rod sections, the filter tipping machine would have to be shut down in immediate response to stoppage of the associated filter rod making machine or machines. As a rule, the supply of filter rod sections in the magazine of a filter tipping machine merely suffices to compensate for extremely short interruptions in delivery of fresh filter rod sections from a maker, either directly or by way of a reservoir system.

The invention is embodied in an apparatus for manipulating filter rod sections or analogous rod-shaped articles which constitute or form part of smokers' products (hereinafter, the articles will be called filter rod sections with the understanding, however, that the apparatus can be readily used or converted for use in connection with the manipulation of other types of rod-shaped articles which constitute or form part of smokers' products).

The apparatus comprises processing means including at least one filter processing machine (especially a filter tipping machine) with a magazine, conveyor means including first and second pneumatic conveyors each having an inlet and an outlet with the outlet adjacent to the magazine of the processing machine, and sender means including discrete first and second pneumatic senders each having its own source of filter rod sections (e.g., a reservoir system, a hopper or an analogous receptacle which receives filter rod sections from the reservoir system or directly from a maker of

filter rod sections) and a plurality of pneumatic propelling units. The propelling units of the first sender include a first propelling unit which serves to deliver filter rod sections from the respective source to the inlet of the first pneumatic conveyor, and the propelling units of the second sender include a first propelling unit which serves to deliver filter rod sections from the respective source to the inlet of the second pneumatic conveyor. The apparatus further includes receiving means including discrete first and second receiving units which respectively serve to transfer filter rod sections from the outlets of the first and second conveyors into the magazine of the processing machine. The just described apparatus is capable of supplying filter rod sections from the first source when the second sender and/or the second pneumatic conveyor and/or the second receiving unit is out of commission, or vice versa.

It is preferred to employ pneumatic conveyors which transport the filter rod sections lengthwise and to utilize receiving units which include means for converting files of filter rod sections into rows and for delivering the rows into the magazine. Thus, the filter rod sections move axially in the pneumatic conveyors on their way toward the corresponding receiving units, and sideways on their way into the interior of the magazine.

The processing means preferably comprises at least one second filter processing machine with a second magazine, and the conveyor means then further comprises third and fourth pneumatic

conveyors having inlets which are respectively adjacent to the first and second senders and outlets adjacent to the second magazine. In such apparatus, the receiving means further includes third and fourth receiving units which respectively serve to transfer filter rod sections from the outlets of the third and fourth pneumatic conveyors into the second magazine. The propelling units of the first sender then include a second propelling unit which delivers filter rod sections from the respective source to the inlet of the third pneumatic conveyor, and the propelling units of the second sender further include a second propelling unit which delivers filter rod sections from the respective source into the inlet of the fourth pneumatic conveyor.

The processing means of the apparatus can comprise at least one additional processing machine having an additional magazine, and the sender means then comprises a third pneumatic sender having a source of filter rod sections and a plurality of propelling units. In such apparatus, the conveyor means comprises fifth and sixth pneumatic conveyors whose inlets are respectively adjacent to the first and third senders and whose outlets are adjacent to the additional magazine. The propelling units of the first sender then include a third propelling unit which serves to deliver filter rod sections from the respective source into the inlet of the fifth pneumatic conveyor, and the propelling units of the third sender include a propelling unit which delivers filter rod sections from the respective source to the inlet of the sixth

pneumatic conveyor. The receiving means then comprises fifth and sixth receiving units which respectively receive filter rod sections from the outlets of the fifth and sixth pneumatic conveyors and deliver the thus received sections into the additional magazine.

The construction of the improved apparatus can be expressed in more general terms as follows: The processing means includes several groups of processing machines each having a magazine, and the sender means includes a discrete sender for eac group of processing machines, each sender having 2m propelling units wherein m is the number of machines in a group. The convey means includes a pair of pneumatic conveyors for each processing machine and each conveyor of a pair of conveyors has an inlet adjacent to a different one of the senders and an outlet adjacent to the magazine of the respective processing machine. The receiv means includes a pair of receiving units for the magazine of each processing machine and each receiving unit is arranged to receive filter rod sections from a different one of the corresponding pai of conveyors for admission into the corresponding magazine. The just outlined construction ensures that each and every processing machine can always receive filter rod sections from one of two different senders, i.e., if one of the senders or the correspondi propelling unit of such sender and/or the corresponding pneumatic conveyor is out of commission, the processing machine can still receive filter rod sections by way of the other pneumatic conveyo

of the corresponding pair of conveyors.

The number (n) of groups of processing machines (such number equals the number of senders) preferably equals m+1 (as explained above, m is the number of machines in a group of processing machines).

In accordance with a presently preferred embodiment, any given sender can supply filter rod sections to all processing machines of a group, and each machine of such group further receives or can receive filter rod sections from a different one of the aforementioned m senders. Thus, the first machine of a group can receive filter rod sections from the first and second senders, the second machine of the same group can receive filter rod sections from the first and third senders, the third machine of the same group can receive filter rod sections from the first and fourth senders, and the fourth machine of the same group can receive filter rod sections from the first and fifth senders (it being assumed that m=4 and n=5). All four machines of the second group of machines then receive filter rod sections from discrete propelling units of the second sender, and the first, second, third and fourth machines of the second group respectively receive or can receive filter rod sections from the first, third, fourth and fifth senders. The situation is analogous for the machines of the third, fourth and fifth groups.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved apparatus itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawing.

FIG. 1 is a schematic plan view of a battery of production lines each of which includes a filter tipping machine and an apparatus for delivery of filter rod sections to the magazine of the filter tipping machine;

FIG. 2 is an enlarged transverse sectional view of a propelling unit for filter rod sections which is designed to deliver a file of filter rod sections to one of two pneumatic conveyors serving to transport filter rod sections to the magazi of a filter tipping machine, the section of FIG. 2 being taken i the direction of arrows as seen from the line II-II of FIG. 3;

FIG. 3 is a smaller-scale central vertical sectional view of the propelling unit, substantially as seen in the direction of arrows from the line III-III of FIG. 2;

FIG. 4 is a schematic front elevational view of the magazine of one of the twenty filter tipping machines in the battery of production lines shown in FIG. 1;

FIG. 5 is an enlarged sectional view as seen in the direction of arrows from the line V-V of FIG. 4 and shows a unit which receives a file of filter rod sections from a pneumatic conveyor and converts the file into a multi-layer stream prior t forcible introduction into the magazine of a filter tipping machine;

FIG. 6 is a circuit diagram of a control unit which regulates the delivery of filter rod sections to opposite sides of the supply of filter rod sections in the magazine shown in FIG. 4; and

FIG. 7 is a circuit diagram of a modified control unit for regulation of the delivery of filter rod sections to opposit sides of the magazine of a filter tipping machine.

FIG. 1 shows schematically a plant which produces filter cigarettes and includes five groups A, B, C, D and E of four filter tipping machines 1a, 1b, 1c, 1d each, i.e., a total of twenty filter tipping machines. The plant comprises five filter rod making machine or filter makers 2A, 2B, 2C, 2D and 2E each of which can deliver filter rod sections of requisite length (e.g., six times unit length) to all four filter tipping machines 1a-1d of one of the groups A-E as well as to one selected filter tipping machine 1a or 1b or 1c or 1d of each other group. As shown in FIG. 1, the filter rod making machines 2A-2E respectively deliver filter rod sections to five discrete reservoir systems 3A, 3B, 3C, 3D and 3E, and these reservoir systems respectively deliver filter rod sections to five discrete pneumatic senders 4A, 4B, 4C, 4D and 4E. Each of the five senders 4A-4E has eight propelling units 9 (see FIGS. 2 and 3) which are connected with selected filter tipping machines by eight pneumatic conveyors including those denoted by reference characters 12a, 12b, 12c, 12d plus four additional pneumatic conveyors respectively denoted by the reference characters 12a', 12b', 12c', 12d' and 12e'. As shown, the first, third, fifth and seventh propelling units 9 of the first pneumatic sender 4A are respectively connected with the filter tipping machines 1a, 1b, 1c, 1d of the first group A by the four leftmost pneumatic conveyors 12a, 12b, 12c and 12d, and the second, fourth, sixth and eighth propelling units 9 of the pneumatic

sender 4A are respectively connected with the filter tipping machine 1a of the group B, with the filter tipping machine 1a of the group C, with the filter tipping machine 1a of the group D and with the filter tipping machine 1a of the group E by the corresponding pneumatic conveyors 12a'. Analogously, the first, third, fifth and seventh propelling units 9 of the pneumatic sender 4B are respectively connected with the machines 1a, 1b, 1c, 1d of the second group B by the second set of pneumatic conveyors 12a-12d (as viewed in a direction from the left of FIG. 1), and the second, fourth, sixth and eighth propelling units 9 of the sender 4B are respectively connected with the filter tipping machines 1a, 1b, 1b and 1b of the groups A, C, D and E by the corresponding pneumatic conveyors 12b'. The first, third, fifth and seventh propelling units 9 of the pneumatic sender 4C are respectively connected with the machines 1a, 1b, 1c, 1d of the group C by the third set of pneumatic conveyors 12a-12d, and the second, fourth, sixth and eighth propelling units 9 of the sender 4C are respectively connected with the filter tipping machines 1b, 1b, 1c and 1c of the groups A, B, D and E by the corresponding pneumatic conveyors 12c'. The first, third, fifth and seventh propelling units 9 of the sender 4D are respectively connected with the machines 1a, 1b, 1c, 1d of the group D by the fourth set of pneumatic conveyors 1a-1d, and the second, fourth, sixth and eighth propelling units 9 of the sender 4D are respectively connected with the machines 1c, 1c, 1c and 1d of the groups A, B, C and E by the corresponding pneumatic conveyors 12d'. The first

third, fifth and seventh propelling units 9 of the pneumatic sender 4E are respectively connected with the machines 1a, 1b, 1c, 1d of the group E by the fifth set of pneumatic conveyors 1a-1d, and the second, fourth, sixth and eighth propelling units 9 of the sender 4E are respectively connected with the machines 1d of the groups A, B, C and D by the corresponding pneumatic conveyors 12e'.

The filter rod making machines 2A to 2E may be of the type known as KDF produced by Hauni-Werke Körber & Co. KG, Hamburg, Federal Republic Germany, the assignee of the present application. The reservoir systems 3A to 3E may be of the type known as RESY, also produced by the assignee of the present application; the pneumatic senders 4A to 4E may be of the type known as Filtromat, also produced by the assignee of the present application; and the filter tipping machines 1a to 1d in each of the five groups A to E may be of the type known as MAX or MAX S, also produced by the assignee of the present application.

Each of the pneumatic senders 4A to 4E comprises eight discrete filter rod section propelling units 9 one of which is shown in detail in FIGS. 2 and 3. Furthermore, each of the filter tipping machines 1a to 1d in each of the five groups A to E is associated with two discrete filter rod receiving units 11 and 11' (see FIG. 4) which have means for accepting filter rod sections 19 from the respective propelling units 9 and further include means for feeding the thus accepted filter rod sections 19 into the magazine 66 of the respective filter tipping machine 1a, 1b, 1c or

1d. The arrangement may be such that the pneumatic conveyors 12a-12d which receive filter rod sections 19 from the sender 4A deliver such sections to the receiving units 11 for the four filter tipping machines 1a-1d in the group A, and the leftmost pneumatic conveyors 12b', 12c', 12d', 12e' respectively deliver filter rod sections 19 from the corresponding propelling units 9 of the pneumatic senders 4B, 4C, 4D, 4E to the receiving units 1. for the machines 1a, 1b, 1c, 1d of the group A. Analogously, the pneumatic conveyors 12a-12d which connect four propelling units 9 of the pneumatic sender 4B with the filter tipping machines of th group B deliver filter rod sections 19 to the receiving units 11 for the corresponding machines 1a, 1b, 1c, 1d in the group B, and the receiving units 11' for the machines 1a, 1b, 1c, 1d in the group B respectively receive filter rod sections 19 from the leftmost pneumatic conveyor 12a', from the second leftmost conveyor 12c', from the second leftmost conveyor 12d' and from the second leftmost conveyor 12e'. The receiving units 11 for the filter tipping machines 1a-1d in the group C receive filter rod sections 19 from the propelling units 9 of the sender 4C via corresponding set of pneumatic conveyors 12a-12d, and the receivir units 11' for the machines 1a, 1b, 1c, 1d in the group C respectively receive filter rod sections 19 from the second leftmost conveyor 12a', from the second leftmost conveyor 12b', from the third leftmost conveyor 12d' and from the third leftmost conveyor 12e'. The receiving units 11 for the filter tipping

machines 1a-1d in the group D receive filter rod sections 19 from those propelling units 9 in the sender 4D which deliver such sections to the corresponding set of pneumatic conveyors 12a-12d, and the receiving units 11' for the machines 1a, 1b, 1c, 1d in the group D respectively receive filter rod sections 19 via the third leftmost conveyor 12a', the third leftmost conveyor 12b', the third leftmost conveyor 12c' and the rightmost conveyor 12e'. Finally, the receiving units 11 for the filter tipping machines 1a-1d in the group E receive filter rod sections 19 from those propelling units 9 in the sender 4E which supply filter rod sections to the corresponding set of pneumatic conveyors 12a-12e, and the receiving units 11' for the machines 1a, 1b, 1c, 1d in the group E respectively receive filter rod sections from the rightmost pneumatic conveyor 12a', rightmost pneumatic conveyor 12b', rightmost pneumatic conveyor 12c' and rightmost pneumatic conveyor 12d'.

One of the total of forty propelling units 9 is illustrated in FIGS. 2 and 3. The construction of these propelling units is similar to that of the propelling unit which is disclosed in commonly owned U.S. Pat. No. 3,827,757 granted August 6, 1974 to Bob Heitmann et al. The disclosure of this U.S. patent is incorporated herein by reference.

FIGS. 2 and 3 show a propelling unit 9 which comprises a shaft 16 serving to transmit torque to a drum 17 having peripheral flutes 18 which are separated from each other by axially parallel

ribs or webs 26. The shaft 16 drives the drum 17 at a constant speed and receives torque from a main shaft 61 through the mediu of a safety clutch 59. The flutes 18 of the drum 17 receive filt rod sections 19 from a supply 22 which is stored in a source here shown as a hopper 21 which receives filter rod sections fro the outlet (not specifically shown) of the corresponding reservo system 3A, 3B, 3C, 3D or 3E. The supply 22 contains parallel filter rod sections 19 and such filter rod sections are allowed to descend by gravity and to enter the oncoming flutes 18 in a region X1 substantially between the 10-1/2 and 1-1/2 o'clock positions of the drum 17, as viewed in FIG. 2. A roller 23 whic is driven by the shaft 16 (or directly by the main shaft 61) in a manner not specifically shown in the drawing serves to agitate th adjacent portion of the supply 22 as well as to prevent jamming and damage to filter rod sections 19 in the zone where the flute 18 move beyond the hopper 21. The drum 17 is driven to rotate i a counterclockwise direction (arrow 15), as viewed in FIG. 2.

The means for interrupting the transfer of filter rod sections 19 from the hopper 21 into the flutes 18 of the drum 17 comprises an elastic intercepting member 28 which is reciprocabl in the hopper 21 in the axial direction of the filter rod sectio 19 and is connected to the reciprocable armature 27a of an electromagnet 27. The latter is installed in the frame 20 of th respective pneumatic sender 4A, 4B, 4C, 4D or 4E and is energizab by an amplifier (FIG. 6) to thereby move its armature 27a in the

direction of arrow 41 shown in FIG. 3, whereby the elastic member 28 (e.g., a flap made of rubber or the like) engages the adjacent end faces of one or more layers of filter rod sections 19 in the hopper 21 and urges the other end faces of such layer or layers against a rear end wall 42 of the hopper 21. The electromagnet 27 and the intercepting member 28 are adjacent to the front end wall 63 of the hopper 21. FIG. 2 shows that the intercepting member 28 can have an arcuate shape with a center of curvature on the axis of the shaft 16 and that the width of this intercepting member can be selected with a view to ensure that the member 28 can engage the end faces of two layers of filter rod sections 19 in the hopper 21. FIG. 3 shows the intercepting member 28 in the retracted or idle position in which the filter rod sections 19 are free to descend toward and into the flutes 18 of the rotating drum 17 while the flutes 18 advance below the region X1. This region is bounded by a stationary wall 24 of the hopper 21 and by an endless belt 24a.

Those filter rod sections 19 which enter the oncoming flutes 18 of the drum 17 are transported from the region X1 to a region X2 where they leave the respective flutes 18 to be introduced into the corresponding pneumatic conveyor (shown at 12 in FIG. 3). The illustrated pneumatic conveyor 12 can constitute any one of the five sets of pneumatic conveyors 12a-12d, any one of the four conveyors 12a', any one of the four conveyors 12b', any one of the four conveyors 12c', any one of the four conveyors 12d' or any one of the four conveyors 12e'.

Each filter rod section 19 which is transferred from th region X1 to the region X2 moves sideways (i.e., transversely of its longitudinal axis), and each filter rod section 19 which has entered the region X2 and is propelled into and caused to move in the associated pneumatic conveyor (12 of FIG. 3) advances axially or lengthwise.

Prior to moving into register with the inlet 12i of the pneumatic conveyor 12 shown in FIG. 3, a filter rod section 19 an the corresponding flute 18 of the drum 17 move into register with a relatively wide cutout or recess 29 which is machined into the concave upper side or surface of a sealing shoe 31 and serves to admit a compressed gas (preferably air) from a source 57 of compressed gas, through a valve 54, a conduit 56, a sloping chann 32 in the shoe 31, a bore 33 which contains a preferably adjustab flow restrictor 34, and into the oncoming flute 18. The thus admitted compressed gas flows around the filter rod section 19 in the flute 18 which registers with the recess 29; therefore, the pressure of gas in the front portion 18a of such flute (the front portion 18a is then adjacent to a sealing disc 36 which engages the front end face of the sealing shoe 31 and has an aperture in register with the bore of the pneumatic conveyor 12) is the same as the pressure in the rear portion 18b of the same flute. This is due to the fact that the rear portion 18b communicates with th channel 32 of the sealing shoe 31 by way of a slot 37 which is machined into a cylinder 37a surrounding the smaller-diameter rea

portion 17a of the drum 17. This ensures that the filter rod section 19 in a flute 18 which moves into register with the recess 29 is not abruptly propelled counter to the direction which is indicated by the arrow 38 when the bore 33 admits compressed gas into the front end portion 18a of such flute and especially when the flute 18 moves into register with the pneumatic conduit 12 wherein the pressure of gas exceeds atmospheric pressure (it is assumed that the filter rod sections 19 in the pneumatic conveyors are transported by compressed gas rather than under the action of suction). When a flute 18 which contains a filter rod section 19 moves into full register with the inlet 12i of the pneumatic conveyor 12, the rear end portion 18b of such flute receives highly compressed gas (normally air) through a pipe or conduit 39 which causes highly compressed gas to enter the rear end portion 18b by way of the respective slot 37 so that the filter rod section 19 is abruptly propelled into the conveyor 12 before the angular movement of the drum 17 could cause a shearing of or other damage to the filter rod section. The arrow 38 indicates the direction of abrupt (practically instantaneous) transfer of a filter rod section 19 from the corresponding flute 18 into the pneumatic conveyor 12. The connection between the outlet of the pipe 39 and the flute 18 which has moved beyond the position of register with the conveyor 12 is interrupted in automatic response to further rotation of the drum 17. In order to facilitate entry of the leader of a filter rod section 19 into the pneumatic

conveyor 12, the inlet 12i of this conveyor preferably flares outwardly and rearwardly, i.e., toward the front end face of the sealing shoe 31.

The same procedure is repeated as the drum 17 continues to rotate and moves successive filled flutes 18 into register first with the recess 29 of the sealing shoe 31 and thereupon with the inlet 12i of the pneumatic conveyor 12.

When the electromagnet 27 is deenergized, a spring (not shown) moves its armature 27a in the direction of the arrow 41 so that the intercepting member 28 engages one or more adjacent layers of filter rod sections 19 and cooperates with the rear end wall 42 to prevent further advancement of filter rod sections from the hopper 21 into the flutes 18 of the drum 17. The drum 17 merely removes those filter rod sections 19 which are located at a level below the lower edge portion of the intercepting member 28 when the electromagnet 27 is deenergized. The drum 17 can continue to rotate with the shaft 16 but the conveyor 12 ceases to receive filter rod sections 19 until after the electromagnet 27 is energized again so as to move the intercepting member 28 counter to the direction which is indicated by the arrow 41 so that the lowermost layers of the supply 22 can descend into the region X1 and the flutes 18 again deliver discrete filter rod sections 19 into the region X2, i.e., toward the positions of alinement with the inlet 12i of the pneumatic conveyor 12.

The sealing block 31 is urged against the drum 17 by a

bell crank lever 43 which is pivotable by a manually operable lever 44. When an attendant pivots the lever 44 in the direction of the arrow 46, the surfaces 47 and 48 of the bell crank lever 43 are moved away from the adjacent surfaces of an adjustable pressure transmitting member 51 which is a bolt or screw having a head 49 engageable by the surfaces 47 and 48. The sealing block 31 is then free to descend and to come to rest on a stationary support 52. The attendant is then in a position to withdraw the sealing block 31 in the direction of arrow 53 by engaging the handle 31a. Such removability of the sealing blcok 31 is of advantage beause it allows for cleaning of the flutes 18 as well as for removal of filter rod sections 19 which happen to be squashed or otherwise damaged or totally destroyed during or preparatory to transfer from the flutes 18 into the pneumatic conveyor 12. Furthermore, such removability of the sealing block 31 renders it possible to allow for convenient cleaning of the channel 32, bore 33, flow restrictor 34 and/or that surface of the block 31 which is normally in sealing engagement with the lower portion of the drum 17.

When the lever 44 is pivoted in the direction of the arrow 46, the bell crank lever 43 automatically closes the valve 54 by way of an operative connection 55 which is indicated by broken lines. The valve 54 is installed in the conduit 56 and interrupts the flow of compressed gas from the source 57 to the channel 32 when the sealing block 31 is disengaged from the drum

17 and/or when the sealing block 31 is removed from the propelling unit 9 of FIGS. 2 and 3. The operative connection 55 has a trip 55a which actuates a signal generator 58 (e.g., a limit switch) when the valve 54 is closed so as to enable the signal generator 58 to transmit a signal for the purposes to be described in connection with FIG. 6.

The aforementioned clutch 59 between the shafts 16 and 61 is disengaged when a squashed filter rod section 19 is caught between the sealing block 31 and the drum 17. Disengagement of the clutch 59 entails a movement of the clutch element 59a in a direction to the right, as viewed in FIG. 3, whereby the clutch element 59a actuates a signal generator 62, e.g., a limit switch. The signal generator 62 transmits a signal which denotes that the shaft 16 is idle, i.e., that the drum 17 does not transport filter rod sections 19 from the region X1 to the region X2. The shaft 61 receives torque from the prime mover of the respective pneumatic sender 4A, 4B, 4C, 4D or 4E.

The level of the upper surface of the supply 22 of filter rod sections 19 in the hopper 21 is monitored by a signal generating photoelectric detector 64 which may constitute a reflection type photocell. The detector 64 is mounted on the front end wall 63 of the hopper 21 and the light beam which issues from its light source can reach the associated transducer when the upper surface of the supply 22 sinks below a predetermined minimum acceptable level. In other words, the detector 64 transmits a

signal whenever the light beam which is emitted by its light source is not reflected by the end face or end faces of one or more filter rod sections 19 in the hopper 21.

FIG. 4 shows the magazine 66 of one of the twenty filter tipping machines (1a, 1b, 1c or 1d in the group A, B, C, D or E). Each magazine 66 can receive discrete multi-layer streams MLS and MLS' of filter rod sections 19 from two receiving units 11 and 11' which are disposed at the opposite sides of the magazine. Since the construction of the receiving unit 11 is identical with that of the receiving unit 11', the component parts of the two receiving units are denoted by similar reference characters except that the characters denoting the parts of the receiving unit 11' are followed by primes.

The receiving unit 11 comprises a speed uniformizing or equalizing accepting conveyor 67 (see FIG. 5) which serves to accept and advance filter rod sections 19 issuing from the outlet of the pneumatic conveyor 12 (it being assumed that the receiving unit 11 is disposed at the discharge end of the pneumatic conveyor whose inlet 12i is illustrated in the left-hand portion of FIG. 3). The accepting conveyor 67 is designed to advance, at a predetermined speed, successive filter rod sections 19 of the file of such sections issuing from the pneumatic conveyor 12. The thus accepted filter rod sections 19 of the file enter an accelerating device 68 which is shown in FIG. 5 and serves to increase the speed of successive foremost filter rod sections 19 of the file

so as to ensure that the sections 19 which advance beyond the accelerating device 68 are separated from each other by gaps G of given width, namely, of a width which is sufficient to prevent a next-following section 19 from interfering with a change in the direction of movement of the preceding section 19. The accelerating device 68 of the receiving unit 11 is followed by a deflecting or reorienting device 69 which causes successive oncoming filter rod sections 19 of the file to move sideways (the sections 19 advance by moving axially or lengthwise through the pneumatic conveyor 12, through the speed equalizing accepting conveyor 67, an arcuate U-shaped guide 72 between the accepting conveyor 67 and the accelerating device 68 and toward the deflecting device 69) toward and into the supply 109 of filter rod sections 19 in the magazine 66. The deflecting device 69 is followed by a device 71 for forcible feeding of filter rod sections 19 (which move sideways) into the interior of the magazine 66 at a level below the upper surface 108 of the supply 109 of filter rod sections therein.

The open side of the arcuate U-shaped guide 72 between the accepting conveyor 67 and the accelerating device 68 is overlapped by a flexible panel or lid 73 of springy sheet metal or the like. The guide 72 also constitutes a direction changing or reorienting device; however, whereas the deflecting device 69 changes the direction of movement of successive accelerated filter rod sections 19 from axial movement to sidewise or transverse

movement, the guide 72 merely changes the direction of axial or lengthwise movement of the non-accelerated filter rod sections 19 through a given angle, e.g., through approximately 90 degrees so that the filter rod sections 19 which move downwardly on leaving the accepting conveyor 67 move horizontally during entry into the accelerating device 68. An advantage of the guide 72 and its cover 73 is that the direction of axial movement of successive filter rod sections 19 can be changed in a very small area and without defacing and/or otherwise damaging the filter rod sections.

The construction of the speed equalizing accepting conveyor 67 is practically identical with that of the accelerating device 68. The only difference is that the device 68 advances the oncoming filter rod sections 19 at a speed which is higher than the speed of lengthwise movement of filter rod sections 19 which leave the conveyor 67. The reference characters denoting the parts of the speed equalizing accepting conveyor 67 are followed by the letter a, and the reference characters which denote parts of the accelerating device 68 (such parts are identical with the corresponding parts of the conveyor 67) are followed by the letter b. As shown in FIG. 5, the accepting conveyor 67 comprises four pulleys 76a, 77a, 78a and 79a. The pulleys 76a, 77a are located at one side of the path of movement of filter rod sections 19 from the outlet of the pneumatic conveyor 12 toward the guide 72, and the pulleys 78a, 79a are located at the other side of such path. The direction in which successive filter rod sections 19 enter the

conveyor 67 and thereupon the accelerating device 68 is indicated by arrows 81. A first enless belt 82a is trained over the pulleys 76a, 77a, and a second endless belt 83a is trained over the pulleys 78a, 79a. The parallel neighboring portions or reaches of the belts 82a, 83a travel downwardly, as viewed in FIG. 5, and the distance between such reaches at most equals the diameter of a filter rod section 19 so that a filter rod section which enters the space between these belts is compelled to advance at the exact speed of the belts on its way toward and into the guide 72. The belts 82a, 83a can accelerate or decelerate successive filter rod sections 19 (or selected filter rod sections), depending upon the speed at which the filter rod sections leave the outlet of the pneumatic conveyor 12. In order to ensure that the speed of the belt 82a invariably matches the speed of the belt 83a, the speed equalizing accepting conveyor 67 further comprises two mating gears 86a, 87a which are respectively coaxial with the pulleys 76a, 78a and have identical diameters as well as identical numbers of teeth. A prime mover 85 which is installed in, on or adjacent to the frame of the filter tipping machine including the magazine 66 of FIG. 5 drives the pulley 76a and the gear 86a through the medium of an endless belt 84a whereby the gear 86a drives the gear 87a and pulley 78a. The pulleys 76a, 78a respectively drive the belts 82a, 83a which, in turn, drive the pulleys 77a, 79a. It is clear that the pulleys 76a-79a can be replaced with sprocket wheels or gears if the belts 82a, 83a are replaced with chains or toothed belts.

The endless belt 84b which is driven by the prime mover 85 (e.g., a variable-speed electric motor) and drives the pulley 76b and gear 86b of the accelerating device 68 causes the belts 82b and 83b to travel at a speed which is higher than the speed of the belts 82a, 83a. This ensures that, if not separated ahead of the accelerating device 68, successive filter rod sections 19 are separated from each other by gaps G of requisite width not later than in the region between the accelerating device 68 and the deflecting device 69.

The deflecting device 69 of the receiving unit 11 cooperates with two endless belts 88 and 89 which are best shown in FIG. 4. The belts 88, 89 form part of the device 71 and serve to forcibly feed successive filter rod sections 19 into the magazine 66. The positions of the belts 88 and 89 are selected in such a way that they move successive filter rod sections 19 sideways, i.e., a single file of sections 19 which advance toward, through and beyond the accelerating device 68 is converted into at least one row of filter rod sections which move sideways upwardly toward and into the interior of the magazine 66. The belts 88 and 89 are respectively trained over pulleys 91, 92 and 93, 94 and the pulleys 92, 94 are respectively coaxial with mating gears 96, 97 which ensure that the speed of the belt 88 invariably matches the speed of the belt 89. The shaft 92a of the pulley 92 is driven by a variable-speed electric motor or another suitable prime mover whereby the shaft 92a drives the pulley 92 and gear 96 (see FIG. 5).

and these parts respectively drive the belt 88 and the parts 94, 97, 89. The belts 88, 89 respectively drive the pulleys 91 and 9. The distance between the parallel inner portions or reaches of the belts 88, 89 at most equals the diameter of a filter rod section 19 so that the filter rod sections which move sideways upwardly and away from the accelerating device 68 are positively entrained and forcibly introduced into the supply 109 which is confined in the interior of the magazine 66.

A plate-like or trough-shaped guide 99 of the deflecti device 69 is disposed between the accelerating device 68 and the lower end turns of the belts 88 and 89. The discharge end of the guide 99 carries or contains a wedge-like deflecting element 102 whose upwardly inclined surface lifts the leaders of successive filter rod sections 19 so that such leaders enter the space between the inner reaches of the belts 88, 89 and are caused to move upwardly as shown in the left-hand portion of FIG. 5. The reference character 101 denotes a tubular guide member which is interposed between the pulleys 77b, 79b of the accelerating devic 68 and the guide 99 of the deflecting device 69. The motion transmitting connection between the aforementioned (non-illustrated) motor and the shaft 92a comprises an endless belt or chain transmission 98 shown in FIG. 5.

The single row of filter rod sections 19 which reach th upper end turns of belts 88, 89 is converted into the multi-laye stream MLS which advances through a funnel 106 including

stationary lower and upper arcuate walls 103, 104 and into the interior of the magazine 66. The walls 103, 104 are integral with or connected to the adjacent side wall 107 of the magazine 66; the side wall 107 has an opening of appropriate size and shape to allow for entry of the multi-layer stream MLS into the interior of the magazine, i.e., into the supply 109.

The operation of the receiving unit 11 is as follows:

The pneumatic conveyor 12 delivers filter rod sections 19 to the speed equalizing accepting conveyor 67 wherein the sections are engaged by the parallel inner reaches of the belts 82a, 83a so that the speed of each and every filter rod section 19 advancing beyond the conveyor 67 (i.e., into the guide 72) matches a predetermined speed. The guide 72 directs successive filter rod sections 19 into the accelerating device 68 (the speed of successive filter rod sections which reach the belts 82b, 83b of the accelerating device 68 also matches a predetermined speed because the speed of all sections 19 leaving the conveyor 67 is identical and the friction between successive sections 19 and the surfaces of the guide 72 and/or cover 73 is constant). The belts 82b and 83b positively engage and propel successive filter rod sections 19 into the guide member 101 whereupon successive sections 19 advance in the trough-shaped guide 99 to reach the wedge-like deflecting element 102 which lifts the leading ends of such filter rod sections so that they can be engaged and entrained by the endless belts 88, 89 of the feeding device 71. The

direction of movement of successive filter rod sections 19 is changed from axial to sidewise movement on entry between the parallel inner reaches of the belts 88 and 89. The leader of an oncoming filter rod section 19 (namely, of a section which advances in the guide member 101 and along the rear portion of th trough-shaped guide 99) cannot interfere with conversion of lengthwise movement into sidewise movement of the preceding section 19 because the difference between the speeds of the belts 82a, 83a on the one hand and the speed of the belts 82b, 83b on the other hand suffices to entail the formation of gaps G of requisite width. The funnel 106 including the stationary walls 103, 104 converts the single row of ascending filter rod sections 19 into the multi-layer stream MLS successive increments of which are forced into the interior of the magazine 66 at a level below the upper surface 108 of the supply 109. The layer MLS is forced into the magazine 66 by the belts 88, 89, i.e., by the single row of filter rod sections 19 which are forcibly introduced into the lower portion of the funnel 106 including the walls 103, 104.

The supply 109 of filter rod sections 19 in the magazine 66 is monitored by a sensor 112 which is pivotably mounted on the side wall 107 and has a projection 113 serving as a trip for a lower signal generator 114 or an upper signal generator 116. Each of these signal generators may constitute a proximity switch of any known design. The free end portion of the sensor 112 does not rest directly on the supply 109 but rather on a loosely mounted

flexible cover 111 which reduces the likelihood of misalignment of filter rod sections 19 forming the supply 109 in the magazine 66. The sensor 112, its projection or trip 113 and the signal generators 114, 116 together constitutes a monitoring device 117 which generates signals when the upper surface 108 of the supply 109 rises above a predetermined upper level or drops below a predetermined lower level.

The bottom portion of the magazine 66 is formed with an outlet opening 118 which receives a portion of a fluted withdrawing or evacuating drum 119 mounted on a driven shaft 119a. The axially parallel peripheral flutes of the drum 119 are shown at 121; these flutes remove filter rod sections 19 from the interior of the magazine 66 for introduction into the filter tipping machine 1a, 1b, 1c or 1d proper. A filter tipping machine which can be used to process the filter rod sections 19 and can be equipped with the magazine 66 of FIG. 4 is disclosed, for example, in commonly owned U.S. Pat. No. 4,237,907 granted December 9, 1980 to Pawelko et al. for "Apparatus for convoluting adhesive-coated uniting bands around groups of rod-shaped articles in filter tipping and like machines". The drum 119 may constitute a so-called severing conveyor which transports filter rod sections 19 sideways past two axially and circumferentially staggered rotary disc-shaped knives (not shown) serving to subdivide each filter rod section 19 into three filter plugs of double unit length. Such filter plugs are normally employed for the making

of filter cigarettes of double unit length, e.g., in a manner as disclosed in the aforementioned U.S. Pat. No. 4,237,907.

An agitating roller 122 is adjacent to one side of the outlet opening 118 to prevent jamming of filter rod sections 19 the region where successive freshly filled flutes 121 advance beyond the outlet opening. The direction of rotation of the roll 122 is the same as that of the drum 119. The right-hand side wa 107' of the magazine 66 shown in FIG. 4 is shortened so as to enable a portion of the roller 122 to agitate the contents of th magazine in the region immediately adjacent to the right-hand si of the outlet opening 118. The receiving unit 11' of FIG. 4 is mirror symmetrical to but otherwise identical with the receiving unit 11.

FIG. 5 shows that the outlet portion of the pneumatic conveyor 12 is equipped with a signal generator 124 which is located downstream of a similar signal generator 123 (see the left-hand portion of FIG. 3). The signal generator 123 includes a light source 123a and a photoelectronic transducer 123b which generates signals in response to detection of light rays emitte by the source 123a. Analogously, the signal generator 124 of F 5 comprises a light source 124a and a transducer 124b. The sig generator 123 is activated whenever the corresponding propellir unit 9 is to deliver filter rod sections 19. For example, the signal generator 123 can be activated simultaneously with energization of the electromagnet 27, i.e., when the electromagr

27 is caused to retract the elastic intercepting member 28 so that filter rod sections 19 of the supply 22 can descend into the region X1. The means for energizing the electromagnet 27 and for activating the signal generator 123 can be actuated by hand or in automatic response to a request signal. The connection between the energizing means and the signal generator 123 may comprise a simple AND gate. FIG. 6 shows that an electromagnet 27A corresponding to the electromagnet 27 can be energized by an amplifier 134A.

As shown in FIG. 6, the signal generators 123, 124 of each pneumatic conveyor are connected in series with discrete time delay units 126 and 127, e.g., time delay units of the type known as Sigmatronic and produced by the firm BBC. The time delay unit 126 transmits a signal in response to failure of the signal generator 123 to detect any filter rod sections 19 for a given (e.g., variable) interval of time, i.e., in response to failure of the propelling unit 9 of FIGS. 2 and 3 to deliver filter rod sections 19 into and beyond the inlet 12i of the pneumatic conveyor 12. On the other hand, the time delay unit 127 transmits a signal in response to continuous (uninterrupted) detection of filter rod sections 19 by the signal generator 124 for a given interval of time.

The manner in which the delivery of filter rod sections 19 from two discrete propelling units 9 (for example, from the leftmost propelling unit of the sender 4A shown in FIG. 1, via

leftmost pneumatic conveyor 12a and to the left-hand receiving unit 11 of the magazine 66 in the leftmost filter tipping machine 1a of the group A as well as from the second leftmost propelling unit 9 of the sender 4B of FIG. 1, via leftmost pneumatic conveyor 12b' and the right-hand receiving unit 11' of the filter tipping machine 1a in the unit A of FIG. 1) to the corresponding receiving units of the associated filter tipping machine is illustrated in FIG. 6. The reference character 131 denotes the entire control unit. The structure of FIG. 1 comprises a total of twenty control units 131, one for each filter tipping machine. Those elements of the control unit 131 of FIG. 6 which serve to regulate the delivery of filter rod sections 19 to the receiving unit 11 of the leftmost machine 1a of FIG. 1 are identical with the elements which serve to regulate the delivery of filter rod sections to the receiving unit 11' of the same filter tipping machine. For the sake of convenient differentiation, the elements in the left-hand half of the control unit 131 are denoted by reference numerals each followed by the letter "A", and the elements in the right-hand half of the control unit 131 are denoted by identical reference numerals each of which is followed by the letter "B". Thus, the parts 58A, 62A, etc. regulate the delivery of filter rod sections 19 from the sender 4A to the receiving unit 11 of the leftmost filter tipping machine 1a, and the parts 58B, 62B, etc. regulate the delivery of filter rod sections 19 from the sender 4B to the receiving unit 11' of the same machine 1a. The outputs of the

signal generators 58A, 62A, 64A are directly connected with the corresponding inputs of an OR gate 136A, and the outputs of the signal generators 123A, 124A are indirectly connected with the corresponding inputs of the OR gate 132A by way of the associated time delay units 126A, 127A. A second OR gate 136B is directly connected with the outputs of the signal generators 58B, 62B, 64B and is indirectly connected with the outputs of the signal generators 123B, 124B (by way of the time delay units 126B, 127B).

In addition to the signal generators 58A, 62A, 64A, 123A, 124A and 58B, 62B, 64B, 123B, 124B which were described and/or identified hereinabove, each control unit 131 further comprises two signal generators 132A and 132B, one for each of the two propelling units 9 cooperating with a given filter tipping machine 1a, 1b, 1c or 1d. The signal generators 132A and 132B are manually operated switches which can be actuated by an attendant to thereby deactivate the respective propelling units 9. As shown in FIG. 6, the signal generators 132A and 132B are directly connected with the corresponding inputs of the respective OR gates 136A and 136B whose outputs are connected with the dominant inputs b of two memories, namely a memory 137A and a memory 137B with system reset.

The inputs a of the memory 137A is connected with the output of an OR gate 138 one input of which is connected with the output d of the memory 137B and the other input of which is connected with the output of a NAND gate 139. One input of the

NAND gate 139 is connected with the output of the OR gate 136A a its other input is connected with the output c of the memory 137 by way of a signal shortening or lengthening unit 141. The purpo of the unit 141 (whose construction is known per se) is to furnis a signal of desired (preferably variable) duration. Thus, if th duration of application of a signal to the input of the unit 141 is less than the desired duration of signal which is to be appli by the output of the unit 141, the latter prolongs the received signal. On the other hand, the duration of signal which is applied to the unit 141 may be excessive; the unit 141 then shortens the signal by interrupting the transmission of the received signal after elapse of a given interval of time.

The input a of the memory 137B is connected with the output d of the memory 137A and the outputs c of the memories 13 137B are respectively connected with the corresponding inputs of two AND gates 142A and 142B. The outputs of the AND gates 142A and 142B are respectively connected with the amplifiers 134A, 13 which control the electromagnets 27A, 27B for the intercepting members 28A and 28B. The second inputs of the AND gates 142A an 142B are connected with the output c of a memory 143 whose input a and b are respectively connected with the signal generators 11 and 114 of the monitoring device 117 shown in FIG. 4. The input b of the memory 143 is a resetting input.

The following description of operation of the control unit 131 applies also for the remaining nineteen units 131. As

explained above, the illustrated unit 131 serves to control the operation of means for supplying filter rod sections 19 to the magazine 66 of the leftmost filter tipping machine 1a of the group A shown in FIG. 1. This machine can receive filter rod sections from the leftmost propelling unit 9 of the pneumatic sender 4A or from the next-to-the-leftmost propelling unit 9 of the pneumatic sender 4B. The connection between the sender 4A and the leftmost machine 1a of the group A includes the leftmost pneumatic conveyor 12a of FIG. 1, and the connection between the pneumatic sender 4B and the leftmost machine 1a of the group A includes the leftmost pneumatic conveyor 12b'.

It is assumed that the aforementioned leftmost and next-to-the-leftmost propelling units 9 of the pneumatic senders 4A and 4B are operative and that the corresponding filter rod making machines 2A and 2B turn out filter rods 19. The output d of the memory 137B with system reset transmits a signal to the corresponding input of the OR gate 138 which transmits the signal to the input a of the memory 137A. Therefore, the output c of the memory 137A transmits a signal to the corresponding input of the AND gate 142A. The latter transmits a signal to the amplifier 134A only when the upper level 108 of the supply 109 of filter rods 19 in the magazine 66 sinks to such an extent that the trip 113 of the sensor 112 actuates the signal generator 116 whose output transmits a signal to the input a of the memory 143. This causes the AND gate 142A to transmit a signal to the amplifier

134A which energizes the electromagnet 27A whereby the latter retracts the intercepting member 28A so that the propelling unit 9 of the sender 4A is free to supply filter rod sections 19 to the inlet of the pneumatic conveyor 12a connecting the leftmost propelling unit 9 of the sender 4A with the leftmost machine 1a of the group A shown in FIG. 1. FIG. 6 shows that the output c of the memory 143 then also transmits a signal to the corresponding input of the AND gate 142B. However, this does not result in energization of the electromagnet 27B because the other input of the AND gate 142B does not receive a signal from the output c of the memory 137B.

Since the conveyor 12a delivers filter rod sections 19 into the magazine 66 of the leftmost filter tipping machine 1a of FIG. 1, the upper level 108 of the supply 109 of filter rod sections in the magazine rises so that the cover 111 pivots the sensor 112 in a counterclockwise direction, as viewed in FIG. 4 whereby the trip 113 approaches and ultimately actuates the signal generator 114 which transmits a signal to the resetting input b of the memory 143 shown in the left-hand portion of FIG. 6. Therefore, the signal at the output of the AND gate 142A disappears and the amplifier 134A deenergizes the electromagnet 134A so that the intercepting member 28A can reassume its operative position and blocks further delivery of filter rod sections 19 into the range of the drum 17 in the respective propelling unit 9 of the pneumatic sender 4A.

The just described series of steps is repeated again and again as long as the just discussed propelling unit 9 of the pneumatic sender 4A remains operative. The situtation changes if one of the signal generators 58A, 62A, 123A (via time delay unit 126A), 124A (via time delay unit 127A) and 132A transmits a signal to the corresponding input of the OR gate 136A. Thus, and as already explained hereinbefore, the signal generator 58A is activated in response to retraction of the sealing shoe 31 from the respective propelling unit 9, the signal generator 62A is actuated if the clutch 59 is disengaged as a result of jamming of a filter rod section 19 in the propelling unit 9, the signal generator 64A is actuated if the supply 22 of filter rods 19 in the hopper 19 is depleted, the signal generator 123A is actuated if the inlet of the pneumatic conveyor 12a ceases to receive filter rod sections 19 from the respective propelling unit 9, the signal generator 124A is actuated if the outlet portion of the pneumatic conveyor 12a piles up an excessive number of abutting filter rod sections 19 upstream of the accepting conveyor 67, and the signal generator 132A is actuated by hand when the attendant desires to arrest the respective propelling unit 9. The output of the OR gate 136A then transmits a signal to the resetting input _b_ of the memory 137A so that the signal at the output _c_ of the memory 137A disappears. At the same time, the output _d_ of the memory 137A transmits a signal to the input _a_ of the memory 137B. Disappearance of a signal at the output _c_ of the memory 137A

results in deenergization of the electromagnet 27A so that the intercepting member 28A is free to assume its operative positio and to prevent further removal of filter rod sections 19 by the rotating drum 17. Thus, the leftmost propelling unit 9 of the pneumatic sender 4A ceases to deliver filter rod sections 19 to the leftmost filter tipping machine 1a of the group A shown in FIG. 1.

The signal which appears at the output d of the memory 137A (simultaneously with disappearance of a signal at the outpu c) is applied to the setting input a of the memory 137B whose output c transmits a signal to the corresponding input of the AN gate 142B. Therefore, as soon as the output c of the memory 14: transmits a signal to the other input of the AND gate 142B, the output of this gate transmits a signal to the amplifier 134B to energize the electromagnet 27B which retracts the associated intercepting member 28B so that the second leftmost propelling unit 9 of the pneumatic sender 4B is free to deliver filter rod sections to the leftmost pneumatic conveyor 12b' of FIG. 1 and thence into the receiving unit 11' of the magazine 66 forming part of the leftmost filter tipping machine 1a of the group A. Thus, instead of receiving filter rod sections 19 from the pneumatic sender 4A, the just mentioned filter tipping machine 1 is then supplied with filter rod sections from the pneumatic sender 4B. The second leftmost propelling unit 9 of the sender 4B cooperates with or includes the signal generators 58B, 62B,

64B, 123B, 124B and 132B. If one of these signal generators transmits a signal to the corresponding input of the OR gate 136B (the signal generator 123B or 124B transmits a signal by way of the corresponding time delay unit 126B or 127B), the output of the OR gate 136B transmits the signal to the erasing input b of the memory 137B. The condition of the memory 137B is then changed so that the signal at its output c disappears, i.e., the AND gate 142B ceases to transmit a signal to the amplifier 134B which deenergizes the electromagnet 27B with the result that the intercepting member 28B is free or is caused to reassume its operative position and to prevent further delivery of filter rod sections 19 from the next-to-the-leftmost propelling unit 9 of the sender 4B into the magazine 66 of the leftmost filter tipping machine 1a of the structure shown in FIG. 1.

When the signal at the output c of the memory 137B disappears, the output d of this memory transmits a signal which is applied to the setting input a of the memory 137A via OR gate 138. If the cause of malfunction of the propelling unit 9 which is controlled by the left-hand half of the unit 131 shown in FIG. 6 (or in the respective pneumatic conveyor 12a) is eliminated, i.e., if such propelling unit 9 is again ready to deliver filter rod sections 19 to the magazine 66 of the filter tipping machine 1a in the group A of FIG. 1, the dominant resetting input b of the memory 137A does not receive a signal from the output of the OR gate 136A and the memory 137A is free to change its condition so

that its output c transmits a signal to the corresponding input of the AND gate 142A. Consequently, the intercepting member 28A is again in a position to permit or interrupt the delivery of filter rod sections 19 from the hopper 21 of the propelling unit 9 in the pneumatic sender 4A in dependency on the position of the trip 113 on the sensor 112, i.e., in dependency on the quantity of filter rod sections 19 in the magazine 66 of the corresponding filter tipping machine 1a. It will be noted that, as a rule, only one of the two propelling units 9 which cooperate with a given filter tipping machine delivers filter rod sections to the magazine 66 of such machine. The other of these propelling units 9 is held in a position of readiness so that it can begin with the delivery of filter rod sections 19 as soon as the one propelling unit is out of commission, either on purpose (signal generator 132A) or due to malfunction (signal generator 58A, 62A, 64A, 123A or 124A). In other words, the propelling unit 9 of the sender 4A should not remain idle until and unless the associated propelling unit 9 of the sender 4B (or the associated pneumatic conveyor 12b") is out of commission (again, either on purpose as a result of actuation of the signal generator 132B or due to a malfunction as indicated by a signal from the signal generator 58B, 62B, 64B, 123B or 124B). As a rule, it is desirable that the leftmost propelling unit 9 of the sender 4A reassume the delivery of filter rod sections 19 to the corresponding magazine 66 without any appreciable delay, i.e., as soon as the attendant has deactivated

the signal generator 132A or as soon as the signal generator 58A, 62A, 64A, 123A or 124A has ceased to transmit "defect" signals to the corresponding input of the OR gate 136A. On the other hand, it is also desirable to avoid mere instantaneous activation of the other propelling unit 9 (namely, of the next-to-the-leftmost propelling unit 9 of the pneumatic sender 4B) because an activation which is immediately followed by deactivation of one and the same propelling unit 9 is likely to cause malfunctioning of such unit and/or of the associated pneumatic conveyor.

Very short-lasting activation of the propelling unit 9 which is controlled by the right-hand portion of the control unit 131 shown in FIG. 6 is prevented as follows: As already explained hereinbefore, the next-to-the-leftmost propelling unit 9 of the pneumatic sender 4B is activated in response to transmission of a signal to the setting input a of the memory 137B so that its output c transmits a signal to the corresponding input of the AND gate 142B which effects energization of the electromagnet 27B for the intercepting member 28B on receipt of a signal from the memory 143. The output c of the memory 137B is connected with the aforementioned signal shortening or lengthening unit 141 so that the output of the unit 141 transmits a signal to the corresponding input of the NAND gate 139 for a preselected interval of time which depends on the setting of the unit 141. Thus, the leftmost propelling unit 9 of the pneumatic sender 4A can be activated only after elapse of that interval of time which is selected by

adjustment of the unit 141. This will be readily appreciated since, when the output of the OR gate 136 ceases to transmit a signal (because the operator has decided to deactivate the signal generator 132A or because the cause of malfunction which has entailed the transmission of a "defect" signal by the signal generator 58A, 62A, 64A, 123A or 124A has been eliminated), the corresponding propelling unit 9 (of the sender 4A) can be reactivated only when the unit 141 ceases to transmit a signal to the corresponding input of the NAND gate 139. The gate 139 transmits a signal only when neither of its inputs receives a signal. A signal from the output of the NAND gate 139 (via OR gate 138) is necessary for application to the input a of the memory 137A whose output c then transmits a signal to the AND gate 142A. Moreover, the signal which appears at the output c of the memory 137A is applied to the erasing input b of the memory 137B to terminate the delivery of filter rod sections 19 from the sender 4B at the time of resumption of delivery of filter rod sections 19 from the sender 4A.

As already explained in connection with FIG. 1, each of the five groups A, B, C, D and E of four filter tipping machines (1a, 1b, 1c, 1d) each normally receives filter rod sections 19 from a common maker 2A, 2B, 2C, 2D or 2E. Each of the makers 2A to 2E is connected with the respective group A, B, C, D or E of machines 1a to 1d by a discrete reservoir system 3A, 3B, 3C, 3D or 3E, a discrete sender 4A, 4B, 4C, 4D or 4E and the corresponding set of

eight pneumatic conveyors (such as the leftmost pneumatic conveyors 12a, 12b, 12c, 12d, the leftmost conveyor 12b', the leftmost conveyor 12c', the leftmost conveyor 12d' and the leftmost conveyor 12e' for the four machines 1a to 1d of the group A). The control unit 131 of FIG. 6 can be used to ensure that the supplies 109 in the reservoirs 66 of all twenty filter tipping machines remain constant or nearly constant, i.e., that the upper levels of such supplies do not appreciably deviate from a desired optimum or average level. To this end, the bottom conveyors of the reservoir systems 3A to 3E are provided with forward and reverse counters (not shown) of any known design. As mentioned above, the reservoir systems 3A to 3E may be of the type known as RESY manufactured by the assignee of the present appplcation. In such reservoir systems, one or more so-called surge bins or first-in last-out reservoirs have bottom walls in the form of endless conveyor belts which can be driven to advance filter rod sections into or to move filter rod sections out of the respective surge bins. The bottom conveyors of the surge bins effect the operation of the respective forward and reverse counters so that the stands of (and output signals transmitted by) the counters are indicative of the quantities of filter rod sections which are stored in the respective surge bins. When both parts of a assembly which is constructed to deliver filter rod sections 19 to a given machine 1a, 1b, 1c or 1d are operative (e.g., if the assemblies including the makers 2A, 2B, the reservoir systems 3A, 3B, the senders 4A,

4B and the leftmost pneumatic conveyors 1a and 1b' of FIG. 1 are ready to deliver filter rod sections 19 to the leftmost machine 1d of the unit A), the control unit for such leftmost machine further comprises means for receiving signals from the outputs of the forward and reverse counters in the reservoir systems 3A and 3B. The control unit 131 then activates the corresponding propelling unit 9 of that sender (4A or 4B) which cooperates with the reservoir system (3A or 3B) whose surge bin contains a larger quantity of filter rod sections 19. The construction of a reservoir system which can be used in the apparatus of FIG. 1 is disclosed, for example, in the commonly owned copending application Serial No. 130,392 filed March 14, 1980 by Tolasch et al. or in the commonly owned copending application Serial No. 130,391 filed March 14, 1980 by Bäse et al.

The control unit 131 then comprises a signal comparing stage whose inputs receive signals from the forward and reverse counters of the two reservoir systems 3A and 3B and whose output transmits a signal to the memory 137A or 137B so as to ensure that the output c of the respective memory transmits a signal to the associated amplifier 134A or 134B as soon as the output c of the memory 143 transmits a signal denoting that the magazine 66 of the leftmost machine 1a in FIG. 1 requires a supply of additional filter rod sections 19. In this manner, the control unit 131 always activates a propelling unit 9 belonging to that sender (4A or 4B) which is associated with the reservoir system (3A or 3B) which,

at such time, stores a larger supply of filter rod sections 19. The provision of the just discussed connections between the forward and reverse counters of the reservoir systems and the control units 131 for the respective filter tipping machines ensures a more uniform utilization of the entire plant, i.e., each and every reservoir system is used to the same or nearly the same degree, and the same applies for the makers and senders of the plant. Moreover, such mode of operation ensures that each and every part of the plant contains an adequate supply of filter rod sections 19 for immediate delivery to a filter tipping machine wherein the supply of filter rod sections has descended below a minimum permissible or acceptable level.

The aforediscussed objects can be accomplished in a somewhat different way by providing the control unit 131 of FIG. 6 with a flip-flop circuit which alternately actuates the one or the other sender for a given filter tipping machine when the magazine 66 of such machine requires a fresh supply of filter rod sections 19. In other words, and referring again to the leftmost filter tipping machine 1a in the group A of FIG. 1, the senders 4A and 4B (as well as the associated reservoir systems 3A, 3B and the corresponding makers 2A, 2B) are assumed to be operative when the leftmost filter tipping machine 1a of the group A requires a fresh supply of filter rod sections 19. The flip-flop circuit also ensures uniform or practically uniform utilization of all components of the assemblies which deliver filter rod sections 19

to various filter tipping machines. Whus, when a given machine requires a fresh supply of filter rod sections for the first time, it receives such sections from one of the associated senders; when the same machine again requires filter rod sections, they are supplied by the other associated sender; thereupon again by the one sender; and so forth.

FIG. 7 shows a control unit 231 which can be used as a substitute for the control unit 131 and can dispense with some or all of the signal generators shown in FIG. 6. The monitoring device 117 of FIG. 4 (denoted in FIG. 7 by the reference character 217 and including proximity switches 214, 216) is combined with a second monitoring device 217' which includes the proximity switch 214 and a further proximity switch 216' (indicated in FIG. 4 by a broken-line circle above the switch 116). The trip 113 of the sensor 112 shown in FIG. 4 comes sufficiently close to the proximity switch 216' of the second monitoring device 217' when the supply 109 of filter rod sections 19 in the magazine 66 is depleted to a minimum permissible level.

The proximity switches 216 and 214 are respectively connected with the inputs a and b of a memory 243 whose output c is connected with the amplifier 134A for the electromagnet 27A which, in turn, controls the position of the intercepting or delivery interrupting member 28A in the same way as described in connection with FIGS. 2, 3 and 6.

The proximity switches 216' and 214 are respectively con-

nected to the inputs a and b of a second memory 243' whose output c is connected with the amplifier 134B for the electromagnet 27B which controls the intercepting or delivery interrupting member 28B in the respective propelling unit 9.

The operation of the control unit 231 of FIG. 7 is analogous to that of the control unit 131. Thus, when the proximity switch 216 of the monitoring device 217 transmits a signal to the input a of the memory 243, the output c of this memory transmits a signal to the amplifier 134A which energizes the electromagnet 27A so that the intercepting member 28A is retracted to its inoperativ position and the corresponding propelling unit 9 of the primary sender (e.g., 4A) delivers filter rod sections 19 into the associated pneumatic conveyor, e.g., into the conveyor serving to supply filter rod sections 19 to the left-hand feeding means 71 of FIG. 4. When the supply 109 in the magazine 66 is replenished to such an extent that the trip 113 of the sensor 112 shown in FIG. 4 actuates the proximity switch 214, the erasing input b of the memory 243 receives a signal and the output c of this memory ceases to transmit a signal for energization of the electromagnet 27A with the result that the intercepting member 28A interrupts the deliver of filter rod sections 19 to the corresponding pneumatic conveyor.

If the propelling unit 9 which includes the intercepting member 28A of FIG. 7 is out of commission for any one of a number of reasons, the supply 109 of filter rod sections 19 in the magazine 66 drops below that level at which the trip 113 of the sensor

112 normally causes the proximity switch 216 to transmit a signal to the input a of the memory 243, i.e., at which the primary sender (4A) for the particular magazine 66 begins to supply filter rod sections 19. The upper level 108 of the supply 109 in the magazine 66 then descends to the level at which the trip 113 of the sensor 112 actuates the proximity switch 216' which transmits a signal to the input a of the memory 243' whose output c transmits a signal to the amplifier 134B to energize the electromagnet 27B which retracts the intercepting member 28B and allows the secondary sender (4B) to proceed with the delivery of filter rod sections 19 into the magazine 66 via feeding means 71'. The delivery of filter rod sections 19 is interrupted when the upper level 108 of the supply 109 in the magazine 66 rises to such an extent that the trip 113 actuates the proximity switch 214 which transmits a signal to the erasing input b of the memory 243' whereby the signal at the output c of the memory 243' disappears and the intercepting member 28B prevents further delivery of filter rod sections 19 from the corresponding propelling unit 9 of the secondary sender 4B.

An advantage of the control unit 231 is that there is no need for signal generators which detect malfunctions of the associated propelling units 9 and/or pneumatic conveyors. All that is needed is to modify the monitoring means so as to add a further proximity switch (216'). The monitoring means of FIG. 7 comprises two integrated monitoring devices 217, 217' having a common signal gene-

rator 214. Each of the devices 217, 217' can comprise two discrete signal generators in the form of proximity switches or the like. Thus, the device 217' can utilize a discrete proximity switch 216' at a level above the switch 216 of FIG. 4 and a discrete proximity switch in addition to the switch 214 and being located at the level of, below or above the switch 114 of FIG. 4. Also, each of the two monitoring devices 217, 217' can employ a discrete sensor.

The main difference between the control units 131 and 231 is that the unit 231 is simpler and also that the unit 231 "recognize or detects the malfunctioning of the propelling unit which includes the intercepting member 28A of FIG. 7 by detecting (via signal generating means 216') that the supply of sections 19 in the magazine 66 of the respective filter tipping machine has dropped to a predetermined minimum permissible level. Thus, the unit 231 does not pinpoint the exact cause of malfunction of a propelling unit and/c the associated pneumatic conveyor but simply reacts to such malfun tion to activate the other (satisfactory) propelling unit and the associated (satisfactory) pneumatic conveyor.

An important advantage of the improved apparatus is that each processing machine 1a, 1b, 1c or 1d can receive filter rod sections whenever necessary regardless of whether or not one of the corresponding propelling units 9 and/or one of the corresponding pneumatic conveyors 12 is out of commission. Since each of the senders 4A to 4E embodies its own source of filter rod sections 19 (see the hopper 21 in FIGS. 2 and 3 or the

corresponding reservoir system), and since each of the filter tipping machines 1a-1d can receive filter rod sections 19 from tw discrete propelling units 9 which form part of two different senders, the failure or malfunctioning of an entire sender also cannot cause an interruption of delivery of filter rod sections to the magazine 66 of a filter tipping machine 1a, 1b, 1c or 1d. Thus, the delivery of filter rod sections 19 to the magazines 66 under a host of adverse circumstances is much more reliable than in heretofore known apparatus in spite of the fact that the numbe of makers (2A-2E) need not exceed the number of groups (A-E) of filter tipping machines 1a-1d, that the number of reservoir system (3A-3E) and/or the number of senders (4A-4E) need not exceed the number of makers (2A-2E) and that the number of makers can be only a small fraction of the total number of filter tipping machines.

Another important advantage of the improved apparatus is that the attendants need not hurry to repair or replace a given propelling unit 9, a given pneumatic conveyor and/or a given sender because the other propelling unit 9 of each pair of associated propelling units (namely of that pair of propelling units which can deliver filter rod sections to pneumatic conveyors for transport into one and the same magazine) suffices to guarantee adequate feed of filter rod sections in the corresponding magazine 66 while the one propelling unit 9 and/or the appurtentan component or components of the apparatus are under repair. This applies regardless of whether the idling of a given propelling

unit is due to malfunction or is attributable to other reasons (such as the need for intermittent inspection and/or repair work of a nature other than that which entails a breakdown of the corresponding propelling unit, of the associated pneumatic conveyor and/or of the corresponding sender). As mentioned above presently known proposals to avoid lengthy stoppages of filter tipping machines due to lack of filter rod sections include the utilization of a system of chargers which must be filled with filter rod sections at the maker, transported to storage or to th locale of use, and emptied at the magazine of a filter tipping machine with considerable outlay for additional costly, sensitive and bulky equipment. The operation with chargers is especially cumbersome if the chargers must be filled, emptied and/or transported by hand.

Since a single sender with several propelling units can supply filter rod sections to a substantial number of pneumatic conveyors, the improved apparatus renders it possible to connect a very large number of processing machines (such as filter tipping machines) with a relatively small number of multiple-unit senders and with an equally small number of reservoir systems and producing machines or makers. The apparatus takes advantage of the fact that a reservoir system can readily satisfy the needs of a sender with several propelling units, even when two or more propelling units of one and the same sender are required to simultaneously deliver filter rod sections to the machines of two

or more discrete processing machines. This is even more so since it does not happen very often that each and every processing machine of each and every group always operates at full capacity or operates at full or nearly full capacity for long periods of time. Therefore, the combination of a reservoir system with a sender which embodies several propelling units is even more likely to temporarily meet the requirements of two or even more discrete filter tipping or like processing machines. Nevertheless, and to be on the safe side, the output of each maker (2A, 2B, 2C, 2D or 2E) is preferably selected in such a way that it at least equals or even slightly exceeds the combined maximum requirements of all filter tipping machines (1a to 1d) of the group A, B, C, D or E.

As shown in FIG. 1, it is often advisable to select the number of processing machines in a group in such a way that it is less, by one, than the number of groups and less than the maximum number of machines which can receive filter rod sections from a single maker. This improves the overall efficiency of the entire apparatus by reducing the number of down times. The number of down times is further reduced, and the efficiency of the apparatus is improved still further if the number of propelling units 9 in each of the senders equals 2m, m being the number of processing machines in a group. This renders it possible to select the connections between the various processing machines and the propelling units of the senders in the aforedescribed manner, namely, so that temporary failure or temporary intentional shutdown

of a set of components including a sender, the corresponding pneumatic conveyors and/or the corresponding reservoir system and/or maker does not cause any interruption of further operation of the processing machines. This is due to the fact that, when a given sender (e.g., the sender 4A) is out of commission, the machines 1a-1d of the group A can continue to turn out filter cigarettes since the machine 1a of the group A can receive filter rod sections from the sender 4B, the machine 1b from the sender 4C, the machine 1c from the sender 4D and the machine 1d from the sender 4E.

The purpose of the control units is to relieve the attendants, i.e., to ensure that the attendants need not continuously monitor the supplies 109 of filter rod sections 19 in the magazines 66 in order to make sure that such supplies will not fluctuate within an excessive range, that the supplies will not be depleted or that the magazines will not be filled to overflowing. First of all, each propelling unit 9 can be started or arrested independently of the other propelling unit or units, e.g., by actuating the signal generator 132A or 132B. Secondly, the various signal generators of FIG. 6 generate signals in response to interruption of delivery of filter rod sections 19 from a sender to the corresponding receiving unit or units. Furthermore, each control unit 131 can start the second of the two propelling units 9 for a given processing machine when the first of these propelling units is idle, or vice versa. Rapid

switchover from delivery by one pneumatic conveyor to delivery by the other pneumatic conveyor for a given magazine 66 is especially desirable and advantageous if the pneumatic conveyors are designed in such a way that they must advance filter rod sections at or close to the upper limit of their capacity if the corresponding magazine is to receive a requisite quantity of filter rod sections per unit of time while such magazine receives filter rod sections from a single pneumatic conveyor (this is contemplated in the embodiment which is illustrated in the drawing). The provision of plural signal generators for each propelling unit 9 is also of help in this connection because the attendants can rapidly locate the locale of a defect or malfunction so that the cause of malfunction can be eliminated with a minimum of delay. It can be said that the improved apparatus comprises a plurality of sets of components each of which includes a pneumatic propelling unit, the corresponding pneumatic conveyor and the respective receiving unit and that each such set is equipped or cooperates with an entire array of signal generators each of which is capable of monitoring a different defect or potential defect and is installed at a locus where the respective defect or malfunction is most likely to occur or most likely to be detected. This can be readily seen by referring again to FIG. 3 wherein the signal generator 123 readily detects eventual causes of malfunction or simply detects malfunctions at the inlet 12i of the pneumatic conveyor 12, the signal generator 62 readily detects the presence of destroyed

filter rod sections 19 and the resulting disconnection of the shaft 16 from the shaft 61, the signal generator 58 readily detects the lack of readiness of the illustrated propelling unit 9 to deliver filter rod sections 19 into the pneumatic conveyor 12, and the signal generator 64 readily detects the absence of a sufficient number of filter rod sections in the source or hopper 21. The same holds true for the signal generator 124 of FIG. 5.

The illustrated receiving units 11 and 11' for each magazine 66 are designed with a view to guarantee proper admission of all filter rods 19 into the interior of the magazine. This is accomplished by the provision of belts 88', 89' and 88, 89 whose parallel inner reaches define channels having a width that is preferably slightly less than the diameter of a filter rod section so that the sections 19 are forcibly introduced into the magazine 66 at the respective sides and cannot lie askew during transport toward, during transport through and/or during transport beyond the respective funnels 106 and 106'. The placing of the two receiving units 11 and 11' at the opposite sides of the magazine 66, i.e., opposite each other, ensures that the filter rod section 19 which are admitted by the funnel 106 cannot interfere with the admission of filter rod sections 19 via funnel 106' or vice versa

The monitoring device 117 for each of the magazines 66 is connected with the corresponding propelling unit 9 in a manner as shown in FIG. 6, i.e., signals which are generated by the detectors 114 and 116 are used to control the positions of the

corresponding intercepting members 28A and 28B so as to regulate the admission of filter rod sections 19 to the respective propelling units 9. These detectors can be said to form part of the corresponding control unit 131.

Portions of receiving units which are similar to those shown in FIGS. 4 and 5 are described and claimed in commonly owned U.S. Pat. No. Re. 28,283 granted April 8, 1975 to Willy Rudszinat.

The present application relates to subject matter which is similar to that of our copending application 81 03156 to which attention is accordingly directed.

CLAIMS:

1. Apparatus for manipulating filter rod sections, comprising processing means including at least one filter processing machine, especially a filter tipping machine, having a magazine; conveyor means including first and second pneumatic conveyors each having an inlet and an outlet, said outlets being adjacent to said magazine; sender means including discrete first and second pneumatic senders each having a source of filter rod sections and at least one propelling unit, the at least one propelling unit of said first sender including or comprising a first propelling unit operable to deliver filter rod sections from the respective source to the inlet of said first conveyor and the at least one propelling unit of said second sender including or comprising a first propelling unit operable to deliver filter rod sections from the respective source to the inlet of said second conveyor; and receiving means including discrete first and second receiving units for transferring filter rod sections from the outlets of said conveyors into said magazine.

2. The apparatus of claim 1, wherein said pneumatic conveyors include means for conveying the filter rod sections lengthwise and said receiving units include means for delivering filter rod sections into said magazine by moving the sections sideways.

3. The apparatus of claim 1, wherein said processing means includes a second filter processing machine having a second magazine and said conveyor means further comprises third and fourth pneumatic conveyors having inlets respectively adjacent to said first and second senders and outlets adjacent to said second magazine, said receiving means further including third and fourth receiving units for respectively transferring filter rod sections from the outlets of said third and fourth conveyors into said second magazine, the propelling units of said first sender including a second propelling unit operable to deliver filter rod sections from the respective source into the inlet of said third conveyor and the propelling units of said second sender including a second propelling unit operable to deliver filter rod sections from the respective source into the inlet of said fourth conveyor.

4. The apparatus of claim 3, wherein said processing means further comprises at least one additional processing machine having an additional magazine and said sender means further comprises a third pneumatic sender having a source of filter rod sections and a plurality of propelling units, said conveyor means further comprising fifth and sixth penumatic conveyors having inlets respectively adjacent to said first and third senders and outlets adjacent to said additional magazine, said receiving means further including fifth and sixth receiving units for transferring filter rod sections from the outlets of said fifth and sixth conveyors to said additional magazine, the propelling units of said first sender further including a third unit operable to deliver filter rod sections from the respective source to the inlet of said fifth conveyor and the propelling units of said third sender including a propelling unit operable to deliver filter rod sections from the respective source into the inlet of said sixth conveyor.

5. The apparatus of claim 1, wherein said processing means includes several groups of processing machines each having a magazine and said sender means includes a discrete sender for each of said groups and each having 2*m* propelling units wherein *m* is the number of machines in a group, said conveyor means including a pair of pneumatic conveyors for each of said processing machines and each conveyor of any of said pairs having an inlet adjacent to a different one of said senders and an outlet adjacent to the magazine of the respective machine, said receiving means including a pair of receiving units for the magazine of each of said machines and each arranged to transfer filter rod sections from a different one of the corresponding pair of conveyors to the respective magazine.

6. The apparatus of claim 5, wherein the number of said groups equals *m*+1.

7. The apparatus of claim 5, wherein the conveyors of said conveying means connect each machine of any one of said groups with a propelling unit of one of said senders as well as with a propelling unit of a sender other than said one sender so that each machine of a group can receive filter rod sections from a different pair of senders but one sender of each such pair is common to all machines of a group.

8. The apparatus of claim 1, further comprising means for independently starting and arresting each propelling unit of each of said senders.

9. The apparatus of claim 8, further comprising signal generating means including at least one signal generator for each of said propelling units and each arranged to transmit a signal denoting a malfunction of the respective propelling unit and/or the corresponding conveyor.

10. The apparatus of claim 9, further comprising control means for said first propelling units, said control means including means for normally effecting the operation of only one of said first propelling units at a time and means for automatically starting the other first propelling unit in the event of malfunction of said one first propelling unit and/or the associated conveyor or vice versa.

11. The apparatus of claim 10, wherein said signal generating means includes a plurality of signal generators for each of said first propelling units and the corresponding conveyors, each of said first propelling units and the corresponding conveyor having portions which are likely to develop malfunctions and said signal generators being positioned to generate signals in response to development of malfunctions at said portions of said propelling units and the respective conveyors.

12. The apparatus of claim 10, wherein each of said propelling units includes means for interrupting the removal of filter rod sections from the respective source and said control means includes means for activating such interrupting means in the event of malfunction of the corresponding propelling unit and/or the associated conveyor.

13. The apparatus of claim 12, wherein said signal generating means comprises a plurality of signal generators for each of said first propelling units and the corresponding conveyors, each of said first propelling units and the corresponding conveyors having portions which are likely to develop malfunctions and said signal generators being positioned to generate signals in response to development of malfunctions at said portions of said first propelling units and the respective conveyors, said control means including means for activating the interrupting means of a first propelling unit in response to the signal from any one of the corresponding signal generators.

14. The apparatus of claim 1, wherein each of said receiving units includes means for forcibly feeding filter rod sections in the magazine of said processing machine.

15. The apparatus of claim 14, wherein said feeding means are spaced apart from each other so that the filter rod sections which are delivered by said first and second conveyors enter different portions of said magazine.

16. The apparatus of claim 15, wherein said magazine has two opposite sides and said feeding means are positioned to deliver filter rod sections into the magazine at said opposite sides thereof.

17. The apparatus of claim 14, wherein each of said feeding means includes a plurality of endless flexible elements which define channels for the passage of filter rod sections into the magazine.

18. The apparatus of claim 17, wherein said flexible elements are endless belts having parallel reaches which define said channels.

19. The apparatus of claim 1, further comprising means for monitoring the supply of sections in said magazine.

20. The apparatus of claim 19, further comprising control means including said monitoring means and further including means for actuating one of said first propelling units when the supply of sections in said magazine is reduced to a given minimum value.

21. The apparatus of claim 19, further comprising control means including said monitoring means and further including means for arresting the operative first propelling unit when the supply of articles in said magazine rises to a predetermined maximum value.

22. The apparatus of claim 1, further comprising a control unit including first and second means for monitoring the supply of filter rod sections in said magazine, said first monitoring means including means for initiating the delivery of sections from the first propelling unit of said first sender when the supply of sections in said magazine is depleted below a first level and said second monitoring means including means for initiating the delivery of sections by the first propelling unit of said second sender when the supply of sections in said magazine is depleted below a lower second level.

23. The apparatus of claim 22, wherein said means for initiating the delivery of filter rod sections by the first propelling unit of said first sender includes a first signal generator and said first monitoring means further comprises a second signal generator which interrupts the delivery of filter rod sections by the first propelling unit of said first sender when the supply of sections in said magazine is replenished to a given value.

24. The apparatus of claim 23, wherein said means for initiating the delivery of filter rod sections by the first propelling unit of said second sender includes a third signal generator arranged to transmit a signal when the supply of filter rod sections in said magazine is depleted to said second level and a fourth signal generator which interrupts the delivery of filter rod sections by the first propelling unit of said second sender when the supply of sections in said magazine is replenished.

25. The apparatus of claim 24, wherein said fourth signal generator of said second monitoring means is said second signal generator of said first monitoring means.

26. Apparatus for manipulating filter rod sections, substantially as herein described with reference to and as illustrated in the accompanying drawings.

27. Apparatus for manipulating filter rod sections, comprising a plurality of filter rod processing machines, sender means including a plurality of discrete pneumatic senders each having a source of filter rod sections and a plurality of selectively operable propelling units, conveyor means including a plurality of pneumatic conveyors for conveying the filter rod sections axially from the propelling units towards the processing machines, each processing machine being connected to two different pneumatic senders by two pneumatic conveyors and respective propelling units of which only a selected one is normally operative, receiving means including receiving units for transferring filter rod sections transversely of their axes from outlets of the pneumatic conveyors into magazines of the processing machines, signal generating means for generating a control signal on interruption of the supply of filter rod sections from said selected one propelling unit to the respective processing machine, and control means responsive to said control signal by actuating the other of said propelling units associated with said processing machine.

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